

Abstract: Impact of blast exposure on speech understanding in noise

Objectives: To measure the fidelity of neural encoding of speech in noise in blast-exposed Veterans compared to non-blast-exposed control participants and examine correlations between neural encoding and speech understanding in noise. To determine if sensory gating is impaired following blast exposure and if this is correlated with speech in noise understanding in blast-exposed Veterans. To determine the amount of overlap in dysfunction among blast-exposed Veterans and a group of older participants who also report difficulty with speech understanding in noise.

Plan: Test blast-exposed and non-blast-exposed individuals to determine the extent to which blast exposure affects the neural encoding of speech and sensory gating, and to determine whether these measures are reflective of behavioral measures of speech-in-noise understanding.

Methods: Up to 90 participants will be recruited to fill the three following subject groups (30 subjects per group): Veterans with recent (within the past 10 years) exposure to high intensity blast waves; older participants (60 years and older) with no history of blast-exposure or TBI; and an age-matched control group with no history of blast-exposure or TBI.

Following audiometric assessment, all participants will undergo behavioral speech-in-noise testing using phoneme, word, and sentence tokens of speech. In addition, neurophysiological measures will be completed on all participants including auditory brainstem responses to speech in quiet and noise, cortical encoding of speech in noise, P300 responses to speech, cortical sensory gating, and sensorimotor gating. Measures will be compared across subject groups using Repeated-Measures ANOVA and the results of the various tests will be related to one another using multiple regression and correlation (MRC) analysis. It is anticipated that each subject will participate in up to seven hours of testing, spread over 2-3 sessions.

Clinical Relevance: As reported by Dennis (2009), the estimated prevalence of traumatic brain injury from blast exposure among Veterans who have served in OEF/OIF is 11.4%, using a fairly conservative methodology. To date, no study has focused on specific neurological changes associated with speech understanding in noise in spite of the fact that previous studies have indicated that this is a longstanding complaint of many blast-exposed Veterans.

Relevance to the VA's Mission: The inability to effectively communicate with others is a huge detriment to quality of life in any population. The fact that so many Veterans are returning from recent conflicts with longstanding problems with communication in challenging but common listening environments indicates the need for the VA to take the lead on developing the appropriate diagnostic and rehabilitative tools for addressing this issue. In addition, rehabilitative measures for other injuries and deficits among this Veteran population may be negatively impacted by difficulties in communicating with health care professionals.

Medical Subject Heading Keywords: Blast Injuries, TBI, Auditory Processing Disorder